California Bay-Delta Surface Storage Program Progress Report

April 2004

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INTRODUCTION

Purpose

This report summarizes progress on the five surface storage project studies identified in the *CALFED Bay-Delta Program Programmatic Record of Decision* (ROD) and includes current information on planning activities, major findings, challenges, budgets and schedules. As this report is finalized, the information it contains is expected to:

- Help potential project partners assess their interest in participating in these surface storage projects; and
- Assist responsible agencies in decisions regarding investment in additional planning for these projects.

The Surface Storage Program

The ROD describes the expansion of water storage as critical to the successful implementation of all aspects of the CALFED Bay-Delta Program (CALFED Program). The ROD includes timelines and milestones for investigations of five new or expanded surface storage projects as an integral part of a comprehensive package of actions to be completed in Stage 1 of CALFED Program implementation. The five surface water storage projects included in the CALFED Program are shown on Figure 1 and include:

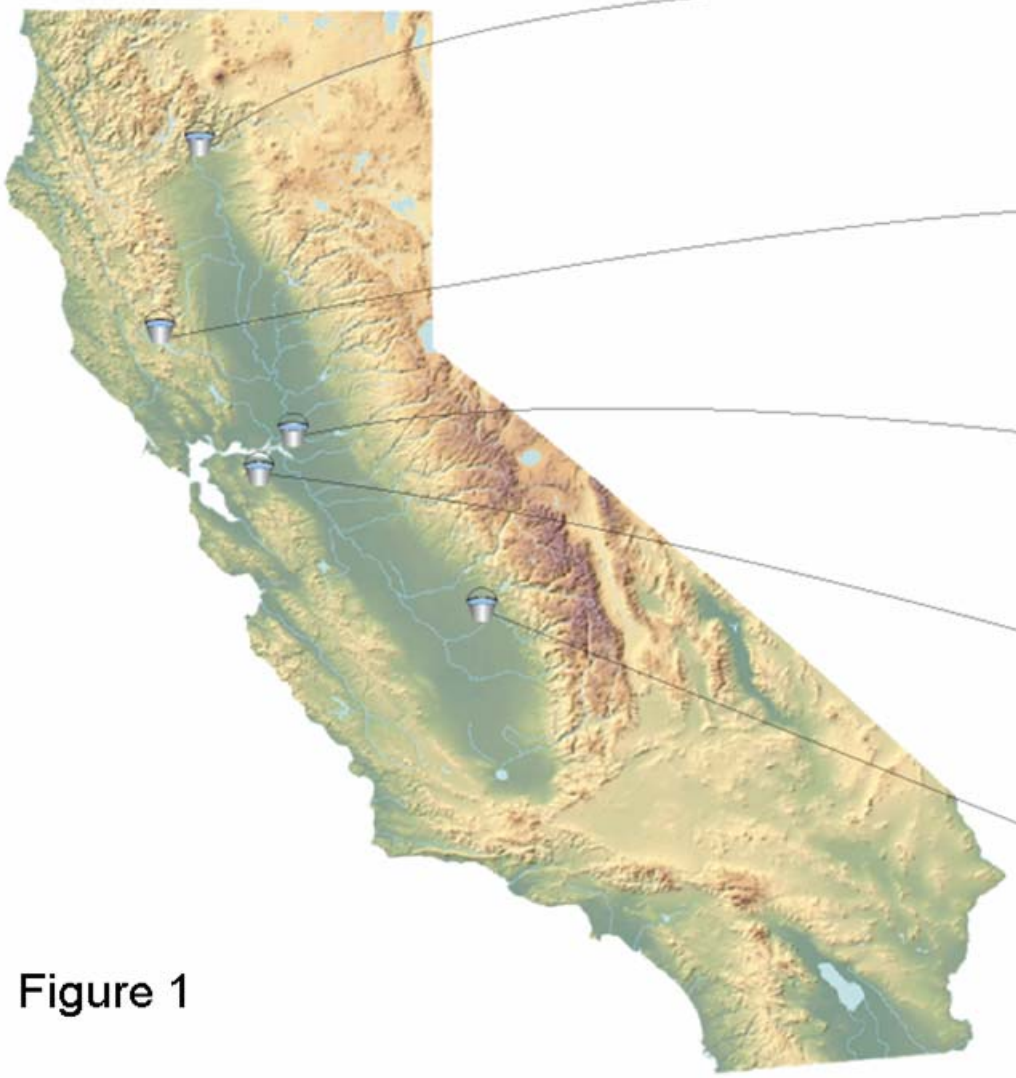
- Shasta Lake Enlargement (Shasta Lake Water Resources Investigation [SLWRI]);
- Sites Reservoir, or equivalent, in the Sacramento Valley (North-of-Delta Offstream Storage [NODOS]);
- In-Delta Storage Project (IDSP);
- Los Vaqueros Reservoir Expansion (LVE); and
- Millerton Lake Enlargement or a functionally equivalent storage program in the region (Upper San Joaquin River Basin Storage Investigation [USJRBSI]).

New surface water storage is one of several water management tools (including expanded groundwater storage, water conservation, and recycling, water quality improvement actions, conveyance improvements, and others) identified in the ROD. Collectively, these actions will improve water supply reliability and drinking water quality while also improving system flexibility to reduce effects of diversions on fisheries and support restoration efforts in the CALFED solution area.

The storage projects discussed in this report could:

- Improve water supply reliability (by direct delivery or exchange) throughout much of the CALFED solution area
- Improve drinking water quality for agencies that divert supplies from the Sacramento River-San Joaquin River Bay-Delta (Bay-Delta).
- Increase storage of cold water to maintain Sacramento River temperatures
- Reduce diversions on the Sacramento River during critical fish migration periods, and provide stable flows for fish during spawning season
- Provide water storage for Delta water quality, or the Environmental Water Account (EWA), or the Ecosystem Restoration Program (ERP), or a combination of the three
- Provide flows to contribute to restoration efforts on the San Joaquin River

CALIFORNIA BAY-DELTA PROGRAM SURFACE STORAGE PROJECTS



Shasta Enlargement
An increase in Shasta storage capacity by 300,000 acre-feet would increase the pool of cold water available to maintain lower Sacramento River temperatures for fish and improve water supply.

Sites Reservoir
This project, with a capacity of about 1.8 million acre-feet, would enhance water management flexibility in the Sacramento Valley and provide storage and operational benefits for other CALFED programs.

In Delta Storage
An In-Delta storage facility of 250,000 acre-feet would provide both fishery benefits and enhanced water project flexibility.

Los Vaqueros Enlargement
Expanding Los Vaqueros reservoir by 200,000 to 400,000 acre-feet would provide water quality and water supply reliability benefits to Bay Area water users.

San Joaquin Storage
Additional storage of 250,000 to 700,000 acre-feet in the upper San Joaquin River watershed would be designed to help restore and improve water quality for the San Joaquin River and facilitate conjunctive water management and water exchanges that improve the quality of water deliveries to urban communities.

Figure 1

As implementing agencies, the Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) are jointly conducting studies with local partners on each of these five potential storage projects.

MAJOR FINDINGS

The following section presents the major findings of the five surface storage studies to date. At the end of this section is a table summarizing the potential benefits of each project.

Shasta Lake Water Resources Investigation

- There are distinct breakpoints in the costs of construction modifications with increasing dam heights and reservoir sizes, with the largest cost increase occurring at dam raises above18 feet.
- Raising the dam 6.5 feet would enlarge Shasta Reservoir by 290 thousand acre-feet (TAF) and could improve water supply reliability in dry years by about 70 TAF/yr, with about 80 percent going to areas south of the Sacramento River-San Joaquin River Delta (Delta). This would provide for an enlarged cold-water pool at Shasta, allowing added flexibility to benefit downstream anadromous fish. No major relocations of Shasta facilities would be required. The inundated area when the reservoir is full (gross pool) would increase by about 700 acres. Infrequent inundation would extend upstream on the McCloud River an estimated 1,400 feet at gross pool.
- Enlarging Shasta Dam by 18 feet could provide about 600 TAF of storage and increase dry year water supply by about 150 TAF/yr. The concept plans that have been developed to address the identified objectives range from physical means of enlarging Shasta Dam and Reservoir in combination with conjunctive use facilities and ecosystem restoration elements, to a non-structural approach focusing on increasing the efficiencies of the existing water supply and flood control operation of Shasta Reservoir.
- The additional inundation of the McCloud River from a Shasta Dam raise up to 20 feet would convert flat water and pool habitats to riffle habitats; cause limited to no impact to rainbow trout migration, reproduction, and recruitment; not change the river temperature regime on the McCloud River; and cause up to 16 acres of lost vegetation habitat due to inundation of the McCloud River upstream of the McCloud River Bridge.
- Potential benefits from the SLWRI would range from increased water supply reliability, particularly to south of Delta users, and an increased cold-water pool at Shasta Reservoir to improve conditions in the upper Sacramento River for anadromous fish. Benefits could also accrue from opportunities to increase flood control, increase hydropower generation, and improve ecosystem function at both the reservoir and along the upper Sacramento River.

North-of-the-Delta Offstream Storage

- Construction of dams at Sites and Newville Reservoir locations are technically feasible.
- There appears to be no endangered plant and wildlife species that cannot be mitigated within the NODOS project areas. Preliminary environmental studies indicate that the Sites Reservoir location has, in general, fewer potential

environmental impacts than Newville Reservoir. Preliminary cultural resources studies also indicate a similar trend toward fewer potential impacts at the Sites Reservoir location.

- The NODOS investigation has prepared an administrative draft *Sacramento River Flow Regime Technical Advisory Group Summary Report and Evaluation* that includes historical information on the Sacramento River and input from diverse stakeholder groups related to potential impacts and benefits associated with NODOS implementation. To date, the Technical Advisory Group (TAG) has not identified any fatal flaws associated with diverting currently unallocated water from the Sacramento River under the operational plans considered for NODOS. The report will help guide future project formulation and impact analyses.
- Preliminary CALSIM II model runs showed that NODOS could provide an average annual water supply benefit of up to 440 TAF/yr. NODOS could provide these water supply benefits to water users on the west side of northern Sacramento Valley, the State Water Project, the Central Valley Project (CVP), the EWA, and northern Sacramento Valley wildlife refuges. In addition, NODOS could provide an average annual supply of up to 250 TAF/yr for Delta water quality improvements. NODOS, through coordinated operation with Shasta Lake, could also provide an average of 460 TAF/yr of additional flows in the spring in the upper Sacramento River to support cottonwood establishment in eight of the 73-year simulation period and 120 TAF/yr of additional flows to maintain stable flows for fish in the upper Sacramento River during September through November. Further, NODOS could reduce diversions from the upper Sacramento River of up to 300 TAF/yr during critical fish migration periods.
- NODOS could provide operational flexibility to the SWP and CVP systems.

In-Delta Storage Project

The State Feasibility Study makes the following findings:

- The re-engineered IDSP construction and operation meet State feasibility requirements with an acceptable level of risk of structural failure and minimal potential for loss of life.
- The IDSP could provide significant improvement in the flexibility of Delta water operations.
- Water supply benefits vary from 124 TAF to 136 TAF/yr. Reductions of up to 30 TAF/yr in water supply benefits are possible due to operational restrictions imposed by the project biological opinion and to regulate water quality. However, the lack of available data currently makes an accurate assessment of these reductions difficult. In addition, the project might provide other benefits, such as operational flexibility, water quality improvements, wildlife and habitat improvements and seismic stability.
- Additional water quality field and modeling evaluations are necessary to refine project operations for organic carbon, dissolved oxygen, and temperature. Recently completed studies indicate that circulating fresh water through the reservoirs could be effective mitigation to resolve the organic carbon issue. A final field investigations and modeling plan should be developed with recommendations from the CALFED Science Panel.

- DWR estimates the total capital cost of the IDSP at approximately $774 million, and the equivalent annual cost at approximately $60 million. DWR has completed a preliminary economic analysis of the water supply improvements IDS could provide and conservatively values these benefits at approximately $23 to $26 million. This estimate is sensitive to assumptions about the future cost and availability of other water management options (e.g., conservation, wastewater recycling, groundwater reclamation etc.) and should be refined in consultation with potential beneficiaries and economic experts.

Los Vaqueros Reservoir Expansion

- Completed operational studies show that an expanded Los Vaqueros Reservoir could meet both the CALFED Program objectives and Contra Costa Water District (CCWD) participation principles while meeting some of the drought supply needs of agencies served by the South Bay Aqueduct (SBA)**.**
- A multi-purpose reservoir would provide maximum benefits if operated to provide water quality and reliability benefits in normal and dry years, and EWA benefits in normal and wet years.
- Through a combination of improved water quality and blending, an additional 145 to 362 TAF (total over six years) of high quality, stored water could be delivered to Bay Area users during a six-year drought.
- By relieving Banks Pumping Plant of its obligation to supply the SBA, 100 TAF to 165 TAF (dry to wet years, respectively) could be provided for the EWA.
- Drinking water quality for SBA water users could be improved by lowering total organic carbon (TOC) by about one third, and by lowering chloride and bromide by about half during droughts.

Upper San Joaquin River Basin Storage

- San Joaquin River water could be stored in a variety of surface water reservoirs. Six surface storage options appear technically feasible.
- Average annual new water supply from surface storage options could be up to 235 TAF/yr to be used for restoring the San Joaquin River, improving water quality in the San Joaquin River, and increasing water supply reliability.
- Regional interest in additional conjunctive management of surface water and groundwater resources is high.

The potential benefits of each project are summarized in Table 1, *Preliminary Capital Costs and Water Supply Improvement Estimates for the CALFED Surface Storage Projects*. Estimates of the water supply improvements that each project might provide are included, along with qualitative descriptions of each project's potential non-water supply benefits. While capital cost estimates for each project are also included in the table, unit costs of water cannot be calculated until total project costs are allocated among all the possible benefits each project might provide. It must be emphasized that the water supply improvement estimates included in the Table 1 do not represent final operational plans for any of the projects. As assumptions are refined with the assistance of potential beneficiaries, new scenarios will be developed and estimates of benefits will be refined. It should also be noted that these water supply improvements

have not been evaluated with a common set of assumptions and, therefore, are not directly comparable. Future progress reports will include evaluations using common assumptions (see *Challenges, Development of Common Baseline Assumptions* for additional detail on the Common Assumptions effort).

Table 1. Preliminary Capital Cost and Water Supply Improvement Estimates for the CALFED Surface Storage Projects

Surface Storage Project	Capital Cost Estimates[1] ($ millions)	Storage Capacity[2] (taf)	CALFED ROD Objectives[3]	Other Non-Water Supply Benefits Being Identified[4]	Water Supply Improvement Estimates[5] (taf/yr)
Shasta Lake Water Resources Investigation[6]	$180 - $280 (6.5' - 18.5' Raise)	300 – 635 (6.5' – 18.5' Raise)	Increase pool of cold water available to maintain lower Sacramento River temperatures needed by certain fish Provide other water management benefits, such as water supply reliability	Ecosystem restoration in Sacramento River	50 – 80
North-of-the-Delta Offstream Storage[7] (Sites Reservoir Alternative)	$1,100 – $2,400	1,800	Enhance water management flexibility in the Sacramento Valley Reduce water diversion on the Sacramento River during critical fish migration periods Increase reliability of supplies for Sacramento Valley Provide storage and operational benefits for other CALFED programs including Delta water quality and the EWA	Water quality improvement Ecosystem restoration in Sacramento River Water management flexibility in Sacramento Valley	300 – 440
In-Delta Storage[8]	$700 - $800	217	Provide both fishery benefits and enhanced water project flexibility	Ecosystem restoration in the Delta	120 – 140
Los Vaqueros Reservoir Expansion[9]	$870 – $1,300 (200 - 400 taf expansion, 2008 dollars)	200 – 400 (Range of Expansion)	Provide water quality and water supply reliability (drought storage and emergency supply) benefits to Bay Area water users	Drinking water quality improvement Water management flexibility in Delta Ecosystem restoration in Delta Storage for environmental water	150 (EWA) [11]
Upper San Joaquin River Storage[10]	$450 - $800 (Yokohl Valley Res. & Temperance Flat Res.)	450 – 1,200 (Yokohl Valley Res. & Temperance Flat Res.)	Contribute to restoration of and improve water quality for the San Joaquin River Facilitate conjunctive water management and water exchanges that improve the quality of water deliveries to urban communities	Additional flood protection	100 – 235

(1) There is a wide range of capital costs for the storage projects due to the wide range of options for storage locations and capacities, pumping plants, intakes, conveyance facilities, and inlet/outlet works being studied. The capital cost estimates are based on 2002-2003 estimates. These cost estimates do not include pumping and operations and maintenance costs.
(2) The range of storage capacity for Shasta Lake Water Resources Investigation, Los Vaqueros Reservoir Expansion, and Upper San Joaquin River Storage reflects the range of storage locations and options being studied.
(3) These are the projects' objectives as specified in the CALFED Record of Decision.
(4) The other non-water supply benefits are those such as water quality improvement, ecosystem restoration, and flood protection that are not readily quantifiable but could be major benefits of the projects.
(5) These are long-term average annual water supply improvements, except where noted, and are defined as additional deliveries above the existing baseline and are estimated from preliminary model runs. The water supply improvements were estimated by each project independently and used different modeling baselines and assumptions. Therefore, direct comparisons of the water supply improvements for the projects may not be appropriate. For example, Shasta Lake and Los Vaqueros Expansion studies assumed Banks PP operating at a maximum pumping capacity of 6,680 cfs. The other projects assumed Banks PP maximum pumping capacity at 8,500 cfs. Future water supply estimates will be made with the same baselines that are being developed by the "Common Assumptions" effort. The wide range of water supply improvements reflects the various operational scenarios, storage locations, and capacities being studied.
(6) Preliminary cost and water supply improvement estimates are from ongoing studies.
(7) Preliminary cost estimates are from ongoing engineering studies and water supply estimates are from preliminary CALSIM II model runs of various operational scenarios, Dec. 2003 & Feb. 2004.
(8) Preliminary cost estimates and water supply estimates are from State Feasibility Report, January 2004, Scenarios 2-4. Water supply improvements, without specific In Delta restrictions (Biological Opinion, SWRCB D1643 and other operating regulations), would be approximately 100 TAF higher. None of the other surface storage projects are at this level of development, and may experience some reductions in water supply benefits after receiving their own project specific restrictions.
(9) Preliminary cost estimates and water supply estimates are from Draft Planning Report, May 2003. Cost estimates in 2008 dollars.
(10) Preliminary cost estimates and water supply estimates are from Phase 1 Investigation Report, October 2003.
(11) 150 taf/year average EWA supply delivered; drought water storage of approximately 250 taf (total over drought hydrologic sequence). Water quality improvements not included.

Federal and State Planning Processes

While the CALFED Program and ROD provide both a comprehensive plan and a process to guide agency coordination, implementing the Program is the responsibility of Federal and State agencies bound by pre-existing Federal and State planning requirements.

Federal water resource development agencies must follow the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&Gs)* which establishes a feasibility study development process. The P&Gs require an iterative process that begins with identifying the water resources problems and opportunities associated with the Federal objective and specific State and local concerns. A central focus of the feasibility study is formulating alternative plans that contribute to the Federal objective of increasing national economic development (NED) while protecting the nation's environment. In addition to a plan that reasonably maximizes contributions to NED, other plans may be formulated with reduced net NED benefits to further address other Federal, State, or local concerns not fully addressed by the NED plan. Each alternative plan is formulated based on criteria of completeness, effectiveness, efficiency, and acceptability.

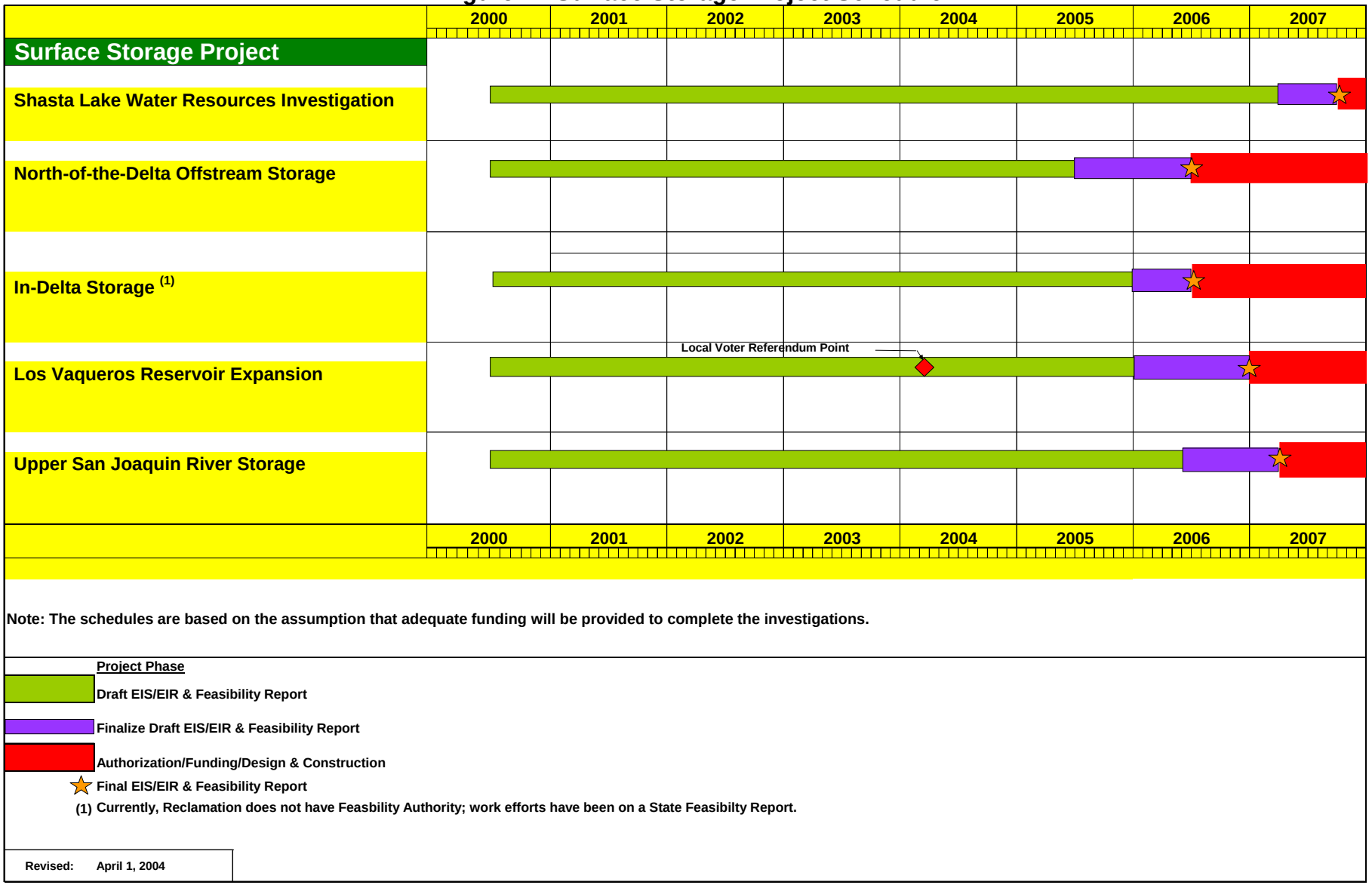
In February 2003, Reclamation received authority to conduct feasibility studies for the NODOS, LVE, and USJRBSI projects. Feasibility authority for the SLWRI is being conducted under the general authority of Public Law 96-375 (1980). Reclamation currently lacks feasibility study authority for the IDSP. Reclamation and DWR, in partnership with local agencies, initiated planning studies in 2000. Several completed pre-feasibility studies are the basis for the major findings described in this report.

A feasibility study results in a Federal decision document for Congressional consideration, and includes: a technical study, a benefit and cost analysis, a definition of Federal interest in the recommended plan, non-Federal sponsor commitments, a cost allocation, and a Planning Report with an Environmental Impact Statement (EIS).

In contrast to the Federal process, the State of California's objective for the feasibility study is to provide technical and financial information to implementing agencies. Key factors necessary for agencies to consider are whether the project could be implemented to assure public health and safety, and whether the project could provide benefits (e.g., water supply reliability, water quality, ecosystem restoration) at a reasonable cost. In the State process, a State feasibility study is followed by an Environmental Impact Report (EIR), detailed economic evaluations, beneficiary designations, and permitting.

Figure 2, *Surface Storage Project Schedule*, depicts a schedule for the Draft Feasibility Report and EIS/EIR; the Final Feasibility Report and EIS/EIR; and Authorization/Funding and Design & Construction for all five storage projects. These schedules are dependent on a variety of factors including available funding and agency resources. Federal funding assumed in this schedule has not been committed. If this funding is not provided, schedules must be extended for some or all of the storage investigations.

Figure 2. Surface Storage Project Schedule



Note: The schedules are based on the assumption that adequate funding will be provided to complete the investigations.

Project Phase

Draft EIS/EIR & Feasibility Report

Finalize Draft EIS/EIR & Feasibility Report

Authorization/Funding/Design & Construction

Final EIS/EIR & Feasibility Report

(1) Currently, Reclamation does not have Feasbility Authority; work efforts have been on a State Feasibilty Report.

Revised: April 1, 2004

CHALLENGES

The Surface Storage Program is facing several key challenges that must be addressed to assure meeting key milestones. This section describes those challenges and the strategies proposed by Surface Storage Program staff to address them.

Challenges Shared by All Projects

Identification of Beneficiaries

The ROD identified potential project purposes for the five surface storage projects called out for investigation; however, it did not specify how project benefits would be distributed, who would receive them, or how the costs of the projects would be allocated. To comply with Federal and State planning requirements, DWR and Reclamation must identify more specific project purposes, operational plans, and end uses of water supplies that could be developed by the projects. While this will require the active participation of local and regional water agencies, those agencies must have initial information on the benefits the projects might provide and the potential costs that might be allocated to them before they can be expected to engage.

Work completed by DWR and Reclamation over the past several years is approaching a point where this initial information on project performance and costs can be provided to local and regional agencies. Completion of this necessary work will require three steps:

1. The project teams must aggressively develop operational scenarios that allow potential beneficiaries the ability to assess their interest in storage project(s). Developing operational scenarios requires technical support of CALSIM II modeling staff from within and outside of Reclamation and DWR. With State contracting now allowed for the Surface Storage Program, work can begin using FY2003/04 contract funds.
2. Development of common conditions for operational modeling must advance more rapidly and use the best available set of assumptions (see *Development of Common Baseline Assumptions*, below).
3. California Bay-Delta Authority (Bay-Delta Authority) staff, along with Federal and State agencies, must complete a finance options plan, including disclosure of State and Federal government agency policies for repayment of project benefits and a determination of project features and operations that benefit the entire State. This effort will include a variety of possible financing mechanisms and cost allocation methods.

Development of Common Baseline Assumptions

A common assumptions process is being developed to assure that the surface storage analyses use a consistent basis for comparison, and that the planning assumptions are based on the most current rules, regulations, and operations. All five storage investigations will use a common set of existing and future no-action baseline conditions for assessing the feasibility, benefits and impacts of the various projects.

The common assumptions effort developing these common baselines is under way. However, a number of factors have impeded progress. First, the State's contract

"freeze" has delayed hiring consultants necessary to continue advancing this effort. This situation is compounded by the current shortage of in-house staff available to conduct the modeling studies. Also, delays in formulating the baseline conditions for the Operations Criteria and Plan (OCAP) has prevented finalizing key operating assumptions. These delays have already impacted planning efforts for the IDSP State Feasibility Study. Operations studies and economic analysis assumptions detailed in the current reports do not include a stakeholder-adopted set of common assumptions, and will likely require future refinements.

In February 2004, the California Department of Finance granted a contract exemption that should allow faster progress on common assumptions work. This exemption will allow DWR and the Bay-Delta Authority staff to hire consultants to continue efforts to work with stakeholders to develop assumptions for the operations models (i.e., quantifying future conservation, recycling, desalination, and conjunctive use estimates). Also, consultants can assist DWR and Reclamation modelers and run new operations studies for the five storage projects.

The storage program cannot wait for final OCAP and other key milestone project decisions before incorporating common assumptions into its models. The program will begin using the best available assumptions for all five storage projects. As assumptions require revisions, the projects will adopt the new assumptions in future studies.

The next steps in the common assumptions process include:

- Complete documentation of policy decisions regarding various model and analytical tool input assumptions
- Characterize water management options, including agricultural and urban conservation, wastewater recycling, desalination, local conjunctive use or other water supply projects, and water transfers, affecting model inputs for water supplies and demand
- Establish an ad hoc stakeholder technical workgroup to review model input assumptions to provide feedback to the California Bay-Delta Public Advisory Committee (BDPAC) Water Supply Subcommittee (WSS). DWR and Reclamation will retain final approval on common assumptions for the planning of the storage projects.
- Create a set of interim common baseline CALSIM II model runs utilizing the best available information and assumptions for existing and future no-action conditions by May 2004 for use by the storage project team

Funding

Sufficient and stable State and Federal funding are critical for the successful completion of the surface storage projects' environmental and feasibility studies. Table 2 shows DWR and Reclamation's funding to date for each of the five storage investigations. Year 1 is the first year of program implementation following the issuance of the ROD and corresponds to State fiscal year July 2000 - June 2001 and Federal fiscal year October 2000 - September 2001.

Table 2. DWR and Reclamation Funding to Date
($ Millions)

Project	Year 1 FY 00/01		Year 2 FY 01/02		Year 3 FY 02/03		Year 4 FY 03/04		Total	
	State	Fed	State	Fed	State	Fed	State	Fed	State	Fed
Shasta Lake Enlargement	-	1.0	0.1	1.9	0.1	2.0	0.5	0.7	0.7	5.6
North-of-the-Delta Offstream Storage	8.1	0.1	4.5	0.8	4.4	0.8	7.6	1.1	24.6	2.8
In-Delta Storage	2.3	0.3	2.2	0.3	1.9	0.3	3.7	-	10.1	0.9
Los Vaqueros Reservoir Expansion	0.7	0.1	1.5	4.5	1.1	2.0	5.8	0.9	9.1	7.5
Upper San Joaquin River Storage	0.6	0.3	0.1	2.5	0.5	1.8	1.0	1.4	2.2	6.0
TOTAL	**11.7**	**1.8**	**8.4**	**9.9**	**8.0**	**6.8**	**18.6**	**4.1**	**46.7**	**22.6**

State General Funds were authorized in Years 1 through 3 of program implementation, but were significantly reduced in Years 2 and 3. Starting in Year 3 (November 2002), DWR shifted the source of State funding from General Funds to Proposition 50, which provided $50 million for surface storage investigations. In addition to funding for the five storage projects, assessments have been made for bond issuance, Science Program support, and common assumptions work. After the current State fiscal year, Year 4, less than $20 million will be available for additional work on the five storage projects.

To date, Federal funding has been a limiting factor in meeting the ROD schedules. Table 3 shows the estimated Federal and State funding needed in years 5 and 6 to stay on the schedule shown in Figure 2. As shown, approximately $41 million will be required for the next two fiscal years, while only $20 million of State funding is relatively secure. Inadequate funding extends schedules and raises time dependent expenses, resulting in increased project costs. Furthermore, without sufficient and stable funding, prioritization and potential deferral of specific projects may be required.

Table 3. Estimated Funding Needs in Years 5 and 6
($ Millions)

Project	Year 5 FY 04/05	Year 6 FY 05/06	Total
Shasta Lake Enlargement	2.0	1.2	3.2
North-of-the-Delta Offstream Storage	8.7	3.3	12.0
In-Delta Storage	2.2	1.9	4.1
Los Vaqueros Reservoir Expansion	8.6	5.2	13.8
Upper San Joaquin River Storage	6.0	2.0	8.0
TOTAL	**27.4**	**13.5**	**41.0**

Project Specific Challenges

Shasta Lake Enlargement

The most critical issue for the SLWRI is the potential for impacts to the McCloud River. Current State law, Public Resources Code 5093.542 (c), allows DWR to conduct technical and economic studies; however, no other State agency can participate in a project that has "an adverse affect on the free flowing condition of the McCloud River" upstream of the McCloud River Bridge or "its wild trout fishery." Shasta Lake, when full, already inundates the river upstream of the McCloud River Bridge. Preliminary estimates show that a 6.5-foot raise of Shasta Dam would inundate McCloud River an additional 1,400 feet. Therefore, the State cannot participate in the SLWRI (beyond those activities allowed for DWR) unless the legislature chooses to modify the Public Resources Code. The Federal government will also be limited in moving forward with feasibility and environmental studies without a local sponsor. Federal funding requires State or local agency participation in environmental documentation and feasibility studies.

Reclamation and DWR are addressing this issue by preparing a report that will outline the potential impacts to the McCloud River from raising Shasta Dam. This report will also describe the potential benefits to the environment by the additional cold pool of water that would be provided by the increased storage. This report will be made available to the State Legislature for evaluation this summer. If the Legislature decides that the overall benefits of a raise might outweigh the impacts, they might consider changing the Public Resources Code to allow participation by other State agencies in the planning process.

North-of-the-Delta Offstream Storage

Early in the NODOS investigation, stakeholders identified the flow regime of the Sacramento River as a primary area of concern related to potential impacts of a NODOS project. Flow regime includes the magnitude, duration, timing and subsequent effects of flows in the river. The Sacramento River's flow regime has been altered over the past century, while interest in the flow regime has grown significantly over the last two decades. Issues of concern related to potential high flow diversions associated with NODOS include Sacramento River geomorphology, meander migration and ecosystem development. At the same time, early NODOS conceptual formulations were conceived

to improve the flow regime of the river for certain ecosystem processes. The NODOS project management team requested that a TAG, (to include local, State, and Federal resources agencies as well as university scientists and environmental advocates and scientists) be established to consider the flow regime of the upper Sacramento River. The TAG was tasked to help identify potential NODOS flow regime impacts and benefits, as well as improve the general understanding of the flow regime of the upper Sacramento River and related ecosystem processes. Meetings of the Flow Regime TAG began in 2002.

The NODOS investigation is preparing a draft *Sacramento River Flow Regime Technical Advisory Group Summary Report and Evaluation* for review by the TAG, NODOS project management team, and ultimately for consideration by a CALFED Science Panel. The report reflects much of the content of the Flow Regime TAG meetings, including summaries of the findings of recently completed and ongoing studies to improve the ecosystem along the Sacramento River between Keswick and Colusa. The report also describes historic changes in the flow regime of the Sacramento River and concepts that may improve the ecosystem habitat both with and without NODOS. Finally, the report documents the need for additional studies related to flow regime and ecosystem processes. When project alternatives and operational plans are defined for NODOS, information from the report will be used to evaluate the potential benefits and adverse impacts to the upper Sacramento River system due to diversion of flows into NODOS.

In-Delta Storage Project

DWR completed the Draft State Feasibility Study and released the *Draft Executive Summary Report* for the IDSP for stakeholder and public review in January 2004. A decision on future project action(s) is planned before July 2004, the start of the next State fiscal year. Possible actions vary from halting project work to beginning negotiations to purchase the project from Delta Wetlands Properties. The major findings of the studies and subsequent stakeholder feedback will be presented to the WSS, BDPAC and the Bay-Delta Authority.

It is anticipated that the BDPAC and the Bay-Delta Authority will make recommendations on future actions to DWR and Bay-Delta Authority staff in May and June 2004, respectively. DWR and Bay-Delta Authority staff will then finalize the State Feasibility Study. A decision on the future of project studies will be made after the June 2004 Bay-Delta Authority meeting.

Los Vaqueros Reservoir Expansion

On March 2, 2004 CCWD ratepayers voted to continue studies to enlarge the Los Vaqueros Reservoir. The advisory vote, Measure N passed with 63 percent of the voters recommending CCWD continue studies to enlarge the Los Vaqueros Reservoir.

DWR and Reclamation staffs are preparing contracts to begin the formal environmental documentation process. A *Notice of Preparation/Notice of Intent* (NOP/NOI) will be issued by May 2004.

Upper San Joaquin River Basin Restoration Plan

Describing the expected ecosystem benefits of providing more water to the San Joaquin River downstream of Friant Dam will require development of an environmental restoration plan, a contentious issue that has been in litigation for more than a decade. Although several agencies and interest groups are developing restoration plans, consensus on a feasible and acceptable plan has not been reached and will likely not be reached for several years. For the purpose of describing the expected ecosystem benefits of the USJRBSI, several alternative restoration plans may need to be evaluated and the benefits described for each.

DWR and Reclamation are continuing to work with local water agencies, environmental groups and local stakeholders to advance the development of a scientifically-based restoration plan that is balanced with water supply needs. Surface Storage Program staff will use this plan to evaluate how expanded storage can contribute to meeting restoration objectives.

California Bay-Delta Surface Storage Program Progress Report
STUDY STATUS

SHASTA LAKE WATER RESOURCES INVESTIGATION

Study Description

Reclamation re-initiated a feasibility investigation in 2000 to evaluate the potential to enlarge Shasta Dam primarily for increased water supply reliability and water quality improvements for anadromous fish survival, with the potential to consider limited hydropower generation and flood damage reduction. This investigation is being conducted under the general authority of Public Law 96-375 (1980).

The ROD provided further guidance for the feasibility investigation by identifying the potential for expansion of Shasta Reservoir to increase the pool of cold water available to maintain Sacramento River water temperatures for anadromous fish and provide other water management benefits such as water supply reliability.

Need for Study

The problems, needs, and opportunities for the SLWRI are described in the following section.

Anadromous Fish Survival

The population of Chinook salmon in the Sacramento River Basin has declined significantly over the past 30 years. Numerous factors contribute to this decline including water diversions from the Sacramento River, drought conditions, reduction in suitable spawning gravels, fluctuations in river flows, acid mine drainage, and fish harvests. However, one of the most significant environmental factors is unstable water temperature.

Various Federal, State, and local projects are addressing each of these factors. They range from changing the timing and amount of reservoir releases to changing the temperature of released water. Although minimum release requirements at Shasta Dam and operation of the temperature control device appear to have benefited winter-run Chinook salmon, there is still a residual need for cooler water in the Sacramento River, especially during dry and critical years.

Water Supply Needs

Demands for water in California exceed available supplies. As the population of the Central Valley continues to grow, along with the needs to maintain a healthy and vibrant industrial and agricultural economy, the demand for adequate and reliable water supplies will become more acute.

Other Environmental Opportunities

The health of the Sacramento River ecosystem has been severely impacted in the last century by conflicts in the use of limited resources, particularly water resources. Construction of Shasta Dam and Reservoir created shoreline and shallow-water habitat for aquatic, terrestrial, and avian species.

Lands upstream from Shasta Lake have been impacted by a variety of activities including historic mining, ore processing practices, and acid mine drainage.

Downstream of Shasta Lake the quantity, quality, diversity, and connectivity of riparian, wetland, floodplain, and shaded riverine habitat along the Sacramento River have been severely limited by the confinement of the river system by levees, Reclamation of adjacent lands for farming, bank protection, channel stabilization, and land development.

Flood Problems
Large and small communities as well as agricultural lands in the Sacramento River Basin continue to be threatened by flooding. Although Shasta Dam controls flood flows significantly in the upper Sacramento River, there are a number of influential factors relevant to downstream flood protection. Accordingly, there is a recognized need for improved flood protection along the Sacramento River.

Hydropower Needs
Although California is the most energy efficient state in the nation, the demands for electricity are growing at a rapid pace. For example, over the next 10 years California's peak demand for electricity is expected to increase 30 percent from about 50,000 megawatt (MW) to about 65,000 MW. There is, and will continue to be, increasing demands for new electrical energy supplies, including clean energy sources such as hydropower.

By raising Shasta Dam, a large cold pool of high quality water would be created, that could be managed to benefit flood control, hydropower, water supply, and aquatic and terrestrial species.

Accomplishments

- A draft of the *McCloud River Technical Report* that identified the potential impacts on the lower McCloud River of enlarging Shasta Lake was completed in January 2003. The report summarizes biological and physical characterizations, including a description of existing conditions, investigative methods, and results.
- A *Shasta Reservoir Area Inventory* was completed in February 2003. The document identified major infrastructure that would be subject to modification or relocation if Shasta Dam were raised up to 30 feet.
- A *Mission Statement Milestone Report* that defines a mission statement of the SLWRI, identifying problems, needs and opportunities, planning objectives and constraints, and concept plans was completed in March 2003.
- An engineering *Break Point Analysis* report was completed in June 2003.
- An *Ecosystems Opportunities Report* that identifies potential ecosystem restoration opportunities that address the objectives of the feasibility study was completed in November 2003.
- Between September and November 2003, a series of stakeholder briefings were held with individuals and groups interested in Central Valley water resources issues as they relate to Shasta Dam.
- A public workshop was held in December 2003 to coordinate with stakeholders potential solutions to identified problems, needs and opportunities associated with anadromous fish survival in the upper Sacramento River, water supply reliability, and related water resources conditions.

Analyses Completed

Planning studies that have been completed to date are as follows:

- Preliminary assessment of impacts on the McCloud River based on physical processes, aquatic and terrestrial habitat and biological resources.
- Primary and secondary planning objectives to address anadromous fish survival, water supply reliability, ecosystem restoration, flood control, and hydropower.
- Preliminary engineering analysis to identify the elevations of dam raise where the project costs significantly change due to the need for relocations or modifications of major project features.
- Plan formulation analysis identifying five conceptual plans to address the planning objectives.
- Temperature and water quality modeling of baseline and with project conditions to benefit anadromous fish in the upper Sacramento River.
- Initial CALSIM II modeling runs of various dam raises to identify potential benefits for water supply reliability, temperature/water quality, and ecosystem restoration objectives.

Major Findings

- The additional inundation of the McCloud River from a Shasta Dam raise up to 20 feet would convert flat water and pool habitats to riffle habitats; cause limited to no-impact to rainbow trout migration, reproduction, and recruitment; not change the river temperature regime on the McCloud River; and cause up to 16 acres of lost vegetation habitat due to inundation of the McCloud River upstream of the McCloud River Bridge.
- There are distinct breakpoints in the costs of construction modifications with increasing dam heights and reservoir sizes, with the largest cost increase occurring at dam raises above18 feet.
- Raising the dam 6.5 feet would enlarge Shasta Reservoir by 290 TAF and could improve water supply reliability in dry years by about 70 TAF/yr, with about 80 percent going to areas south of the Delta. This would provide for an enlarged cold-water pool at Shasta allowing added flexibility to benefit downstream anadromous fish. No major relocations of Shasta facilities would be required. The inundated area when the reservoir is full (gross pool) would increase by about 700 acres. Infrequent inundation would extend upstream on the McCloud River an estimated 1,400 feet at gross pool.
- For a dam raise above 18 feet, the Pit River Bridge must be relocated and will almost double construction costs.
- Enlarging Shasta Dam by 18 feet could provide about 600 TAF of storage and increase dry year water supply by about 150 TAF/yr. The likely concept plans that have been developed to address the identified objectives range from physical means of enlarging Shasta Dam and Reservoir in combination with conjunctive use facilities and ecosystem restoration elements, to a non-structural approach focusing on increasing the efficiencies of the existing water supply and flood control operation of Shasta Reservoir.
- Potential benefits from the SLWRI would range from increased water supply reliability, particularly to south of Delta users, and an increased cold-water pool at Shasta Reservoir to improve conditions in the upper Sacramento River for

anadromous fish. Benefits could also accrue from opportunities to increase flood control, increase hydropower generation, and improve ecosystem function at both the reservoir and along the upper Sacramento River.

Next Steps

The next steps in the study process will be to develop an initial set of alternative plans to address the study objectives.

- Spring 2004 – Release an *Initial Alternatives Information Report*
- Spring 2004 - Conduct scoping meetings and release *Scoping Report*
- Summer 2005 – Release *Plan Formulation Report*
- Spring 2007 – Release *Draft Feasibility Study Report & EIS/EIR*
- Fall 2007 – Release *Final Feasibility Study Report & EIS/EIR*

NORTH-OF-THE-DELTA OFFSTREAM STORAGE

Study Description

As directed by the ROD, in November 2000 DWR and Reclamation formed a partnership with local water interests as well as other State and Federal agencies to investigate offstream storage north of the Bay-Delta. Under the NODOS, the partnership is investigating a range of alternatives, including Sites Reservoir and Newville Reservoir and associated source and conveyance options.

The objectives identified in the ROD included enhancing water management flexibility in the Sacramento Valley while reducing water diversions from the Sacramento River during critical fish migration periods; increasing reliability of supplies for a significant portion of the Sacramento Valley; and providing storage and operational benefits for other CALFED programs including Delta water quality and the EWA.

Need for Study

The problems and needs to be addressed by additional offstream storage in the Sacramento Valley are described in the following sections.

Ecosystem Needs

In response to ecosystem concerns, water management in the Sacramento River and the Bay-Delta has been significantly modified in recent years to meet various environmental needs. The Central Valley Project Improvement Act (CVPIA) required the dedication of 800 TAF of CVP yield to meet ecosystem needs and that further reduced Sacramento River and the Delta CVP supplies. Current water supply commitments and storage on the Sacramento River limit the amount of water available for ecosystem needs. Specific ecosystem needs identified during the NODOS studies include: reduced diversions from the Sacramento River during critical fish migration periods, stabilized or increased flows during spawning periods, and supplemental flows in the Sacramento River and Yolo Bypass to support specific ecosystem processes.

Additional offstream storage can provide the capability to increase instream flows during critical fish migration periods without impacting Sacramento Valley water users' supplies. This operational capability can be used to maintain and restore ecosystem habitats in the upper Sacramento River from Keswick to Colusa. In addition, through coordinated operations, NODOS can contribute to increased storage and cold water pools in upstream reservoirs.

Water Quality Needs

The Bay-Delta system is a source of drinking water for over 20 million Californians and is critical to the State's agricultural and industrial sectors. It also provides vital habitat for 750 plant and animal species. The ROD identified a need to improve Delta water quality, which can enhance ecosystem health and California's long-term water supply reliability. NODOS can improve Delta water quality by releasing stored water into the Sacramento River to increase Delta outflows.

Operational Flexibility Needs

The Bay-Delta system provides the water supply for a wide range of needs, including in-stream flows for aquatic species, riparian habitat, and other benefits to municipal, industrial, and agricultural users. These competing demands for water among different sectors have restricted the operational flexibility of the SWP and CVP systems and consequently negatively impacted the quantity, quality, and timing of deliveries.

By storing additional water north of the Delta, NODOS can contribute to improved operational flexibility in the SWP and CVP systems for enhanced statewide water supply reliability and additional ecosystem benefits.

Water Supply Needs

A significant risk of more frequent and severe water supply shortages exists given the present capabilities of regional and statewide water project infrastructure and current water management practices. In addition, the demand for water within the Sacramento River basin is expected to increase as the region continues to respond to urban and industrial growth pressures. The development of additional supplies will be necessary to meet growing regional and statewide agricultural, urban, industrial, and environmental water needs. The additional storage provided by NODOS can help increase the water supply reliability for a significant portion of the Sacramento Valley, SWPand the CVP, during normal conditions and especially during droughts. This additional storage can also provide water supply for rice straw decomposition in the Sacramento Valley as well as the EWA.

Accomplishments

- DWR and Reclamation have signed a joint planning Memorandum of Understanding (MOU) with 12 local water agencies and counties and five State and Federal agencies in November 2000.
- *Notices of Preparation and Intent* were filed in November 2001.
- Completed public and tribal scoping, and released a scoping report in October 2002.
- Reclamation was authorized by Congress to conduct a feasibility investigation of NODOS in February 2003.
- Released the *Notice of Initiation of Federal Feasibility Studies,* September 2003
- Guidelines for working with Tribes were developed and Tribal involvement in planning studies was initiated in 2003.
- In 2003, a series of CALSIM II modeling runs exploring potential operational scenarios was completed.
- In January 2004, the development of a NODOS reservoir and upper Sacramento River water quality model was completed.
- An Administrative *Draft Flow Regime Technical Advisory Group Summary and Evaluation Report* for NODOS was completed in January 2004.

Analyses Completed

DWR and Reclamation with input from planning partners and some stakeholders developed various operational scenarios emphasizing water supply, Delta water quality, ecosystem restoration, and the EWA. In addition, DWR and Reclamation have been performing studies to develop engineering, environmental, and cultural resources

information needed for the environmental and feasibility analyses. The analyses completed are listed below.

- Preliminary CALSIM II modeling runs of operational scenarios to identify potential benefits for water supply reliability, water quality, and ecosystem restoration objectives.
- Completed feasibility-level engineering studies on dams and saddle dams, alternative configurations for conveyance facilities (canals and pipelines), and road relocation alternatives for Sites and Newville Reservoir locations.
- Completed 85 percent of the required environmental studies to evaluate potential impacts to animal and plant species and to assess potential habitat mitigation requirements.
- Cultural resources studies to evaluate potential impacts to historic and pre-historic sites and cemeteries have been completed for the Sites Dam, road relocations and conveyance structures.
- Independent Consultant Board review of Sites Reservoir feasibility engineering design was completed successfully in January 2003.

Major Findings

- Construction of dams at Sites and Newville locations are considered to be technically feasible.
- There appears to be no endangered plant and wildlife species that cannot be mitigated within the NODOS project areas. Preliminary environmental studies indicate that the Sites Reservoir location has in general fewer potential environmental impacts than Newville. Preliminary cultural resources studies also indicate a similar trend toward fewer potential impacts at the Sites Reservoir location.
- The NODOS investigation has prepared an administrative draft *Sacramento River Flow Regime Technical Advisory Group Summary Report and Evaluation* that includes historical information on the Sacramento River and input from diverse stakeholder groups related to potential impacts and benefits associated with NODOS implementation. Stakeholders have not yet identified any fatal flaws associated with diverting currently unallocated water from the Sacramento River. The report will help guide future project formulation and impact analyses. The draft report will be reviewed by TAG participants and the NODOS project management team prior to public release and review by a Bay-Delta Authority Science Panel.
- Preliminary CALSIM II model runs showed that NODOS could provide an average annual water supply benefit of up to 440 TAF/yr. NODOS could provide these water supply benefits to water users on the west side of northern Sacramento Valley, the SWP, the CVP, the EWA, and northern Sacramento Valley wildlife refuges. In addition, NODOS could provide an average annual supply of up to 250 TAF/yr for Delta water quality improvements. NODOS, through coordinated operation with Shasta Lake, could also provide an average of 460 TAF/yr of additional flows in the spring in the upper Sacramento River to support cottonwood establishment in 8 of the 73-year simulation period and 120 TAF/yr of additional flows to maintain stable flows for fish in the upper Sacramento River during September through November. Further, NODOS could reduce diversions from the upper Sacramento River of up to 300 TAF/yr during critical fish migration periods.

Next Steps

The next steps in the planning process will be to identify project beneficiaries, develop project alternatives, and prepare the draft environmental documents and feasibility report. After project beneficiaries are identified and alternatives are formulated, the purpose and need statement will be completed. DWR and Reclamation will evaluate the alternatives and prepare a draft Section 404 Clean Water Act document and the draft environmental documents and feasibility report.

- Summer 2004 - Release *Initial Alternatives Report*
- Spring 2005 – Release *Plan Formulation Report*
- Summer 2005 – Release *Draft Feasibility Study Report* and *EIS/EIR*
- Summer 2006 – Release *Final Feasibility Study Report* & *EIS/EIR*

In-Delta Storage Project

Study Description

In 2001, the DWR and the Bay-Delta Authority, with technical assistance from Reclamation, conducted a joint planning study to evaluate the Delta Wetlands Project and other IDSP options for contributing to CALFED water supply reliability and ecosystem restoration objectives. The main purpose of these investigations was to determine if the proposed Delta Wetlands Project was technically and financially feasible.

The joint planning study, which was completed in May 2002, concluded the IDSP concepts, as proposed by Delta Wetlands, were generally well planned. However, IDSP modifications and evaluations were needed to make the IDSP acceptable for public ownership. The BDPAC WSS reviewed the Planning Study report findings. In June 2002, BDPAC adopted recommendations of the WSS to continue studies of the IDSP, and to support DWR's Work Plan to conclude all necessary technical studies by June 30, 2003. The State feasibility study draft reports were released for public review on February 2, 2004.

The IDSP would provide capacity to store approximately 217 TAF of water in the south Delta for a wide array of water supply, water quality and ecosystem benefits. The project would include two storage islands (Webb Tract and Bacon Island) and two habitat islands (Holland Tract and Bouldin Island), similar to that proposed by Delta Wetlands over a decade ago, but would also include:

- New embankment design
- Consolidated inlet and outlet structures
- New project operations
- Revised Habitat Management Plans

Need for Study

The IDSP could provide a variety of benefits and contribute to meeting each of the CALFED Program's four objectives for water supply reliability, water quality, ecosystem restoration, and levee system integrity. The following sections describe the needs of this project in more detail.

Water Supply and Operational Flexibility Needs

The Bay-Delta system provides the water supply for a wide range of beneficial uses such as drinking water for millions of Californians, irrigation water for agricultural land, and in-stream and riparian uses. Some beneficial uses depend on the Bay-Delta system for only a portion of their water needs, while others are highly or totally dependent on Bay-Delta water supplies. Competition for Bay-Delta water supplies increases during certain seasons and during dryer years. Also, fish and wildlife requirements have reduced Bay-Delta water supplies and flexibility needed to meet the quantity and timing of water delivered from the Bay-Delta system. There is a need to improve the water supply reliability and operational flexibility of the State's water resource development system.

The IDSP could produce additional water deliveries to urban water users and for agricultural use. IDSP operations could result in additional system-wide carryover storage that could benefit the cold water pool, recreation and improve the reliability of other project deliveries. The IDSP could be used for interim storage for water transfers from upstream areas to areas south of the Delta. Water from upstream areas could be moved into IDSP on a temporary basis until pumping capacity at the south Delta export pumps becomes available.

The IDSP's strategic location within the Delta provides enhanced operational flexibility of the CVP and SWP in responding to short-term operational needs resulting in greater environmental protection and water supply reliability.

Water Quality Needs

Good water quality is required to sustain the high-quality habitat needed in the Bay-Delta system to support a diversity of fish and wildlife populations. In addition, the Bay-Delta system is a source of drinking water for over 20 million Californians and is critical to the State's agricultural and industrial sectors. Measures that can reduce salinity entering the Delta increase the utility of Bay-Delta system waters for many purposes. The ROD identified a need to improve Delta water quality, which can enhance ecosystem health and California's long-term water supply reliability.

The IDSP could help reduce salinity intrusion by making releases of fresh water into the Delta. Also, it could improve export water quality by storing water when Delta inflow quality is good and salinity is low.

Ecosystem Needs

The overall health of the Bay-Delta system has declined as a result of many factors, including upstream water development and use, as well as degradation and loss of habitats that support aquatic and terrestrial life. There is a need to improve the in-Delta, upstream, and downstream movement of all life stages of aquatic species, and a need to increase the quality and amount of habitat needed to sustain and enhance various species.

The IDSP could provide water needed to support the EWA program, enhancing the EWA ability to respond to real-time fisheries needs. Releases from the IDSP could help meet spring pulse flows proposed in the ERP. The IDSP could also provide additional water quality and aquatic habitat improvements by strategically releasing carryover water saved in island storage.

The IDSP could provide water for supplies (in addition to Level 2 refuge supply) to meet CVPIA Level 4 refuge demand. This would benefit CVPIA fish, wildlife, and associated habitats in the Central Valley. This could also be considered as system-wide use and improve the operational flexibility of the CVP.

Wildlife habitats would be improved and protected by developing terrestrial, aquatic, and wildlife-friendly agricultural habitats on Holland Tract and Bouldin Island.

Protect Delta Levees
There is a need to minimize the risk of levee failure in the Delta. Flood flows and/or earthquakes could cause Delta levees to fail, resulting in an interruption of water supplies and degradation of water quality and aquatic habitats.

Diversions to the reservoir islands would occur during high flow season, lowering flood levels in adjoining channels and reducing the risk of flooding to neighboring islands. Releasing water from the reservoirs before the expected flood peak arrives could increase storage space.

The embankments would withstand higher magnitude earthquakes compared to existing levees, reducing the chance of embankment failure and associated saltwater inflow from the Bay. In case of a seismic failure of adjoining islands, the reservoirs could release fresh water to repel salt water.

Increase Recreation
There is a need to enhance public recreation within the Delta. The proposed reservoir and habitat islands could provide more public recreation in the Delta. Recreational opportunities could include hunting, fishing, hiking, biking, and interpretative experiences and have a positive effect on local economy.

Accomplishments

- Reclamation completed the *Delta Wetlands Appraisal Report, April 2000*.
- DWR completed the *In-Delta Storage Investigation Pre-Feasibility Study Draft Executive Summary Report, September 2000*.
- DWR and the Bay-Delta Authority completed a joint planning study with technical assistance from Reclamation, including a pre-feasibility evaluation of alternatives. The *In-Delta Storage Program Draft Summary Report* and supplemental reports on operations, water quality, engineering, environmental and economic evaluations were released in May 2002.
- *A State Feasibility Study* was completed and the *Draft Executive Summary*, along with supporting study reports, was released in February 2004.

Analyses Completed

- IDSP alternatives were evaluated during the pre-feasibility study phase to aid decision-makers in developing a framework for future feasibility studies.
- Analyses of the original Delta Wetlands proposal were completed to assess technical feasibility for public ownership. The analyses concluded that the IDSP concepts as proposed by Delta Wetlands were generally well planned. However, project modifications and evaluations were needed to make the IDSPacceptable for public ownership.
- Developed and analyzed the re-engineered the IDSP to resolve issues related to water quality, structural stability, and overall risk. Operational and water quality modeling studies were conducted with daily CALSIM and DSM2 models. State feasibility level engineering design and cost estimates were completed and a risk analysis was performed.

- Science Reviews of the Joint Planning Study and the State Feasibility Study were done in 2001 and 2003.
- Independent Board of Consultants reviewed the engineering design in 2001 and 2003.

Major Findings (by the State)

- The re-engineered IDSP construction and operation meet State feasibility requirements with an acceptable level of risk of structural failure and minimal potential for loss-of-life.
- Additional water quality field and modeling evaluations are necessary to refine IDSP operations for organic carbon, dissolved oxygen, and temperature. The recent studies indicate that circulating fresh water through the reservoirs could be effective mitigation to resolve the organic carbon issue. A final field investigations and modeling plan should be developed with recommendations from the CALFED Science Panel.
- The IDSP could provide significant improvement in the flexibility of Delta water operations.
- Water supply benefits vary from 124 to 136 TAF/yr. In addition, the IDSP might provide other benefits, such as operational flexibility, water quality improvements, wildlife and habitat improvements and seismic stability.

DWR estimates the equivalent annual cost for the IDSP at approximately $60 million. DWR has completed a preliminary economic analysis of the water supply improvements the IDSP could provide and conservatively values these benefits at approximately $23 to 26 million. This estimate is extremely sensitive to assumptions about the future cost and availability of other water management options (e.g., conservation, wastewater recycling, groundwater Reclamation etc.) and should be refined in consultation with potential beneficiaries and economic experts. DWR estimates that an additional $2 million in annual benefits would be associated with the recreation, flood damage reduction, and avoided levee maintenance provided by the IDSP. In addition, the IDSP might provide other benefits, such as operational flexibility, water quality improvements, wildlife and habitat improvements, and seismic stability. Before total IDSP benefits and cost can be compared, value must be assigned to these benefits.

Next Steps

Before DWR can recommend appropriate next steps for the IDSP proposal, it is essential that all stakeholders, including potential IDSP participants and affected parties, review the information provided in the draft report and provide feedback on the value of the benefits the IDSP might provide relative to its costs, impacts and other IDSP implementation issues.

DWR is planning to follow the decision process as outlined below.

- DWR will work with the BDPAC and the Bay-Delta Authority to gather input from interested parties regarding the value of potential IDSP benefits before completing the benefits analysis.

- DWR and/or the BDPAC will brief the Bay-Delta Authority at their April 8, 2004 meeting. Recommendation(s) on future steps will be made to the Bay-Delta Authority for their consideration.
- DWR will finalize the *State Feasibility Study* and implement additional steps in the IDSP investigation based upon guidance from the Bay-Delta Authority. If a decision is made in April 2004 to move forward with studying the IDSP, the following schedule is proposed:
  - Spring 2004 - Issue a *NOP/NOI* for environmental documentation
  - Summer 2004 – Conduct scoping meetings and release *Scoping Report*
  - Spring 2005 – Release *Plan Formulation Report*
  - Winter 2005 – Release *Draft EIS/EIR*
  - Summer 2006 – Release *Final EIS/EIR*

LOS VAQUEROS RESERVOIR EXPANSION STUDY

Study Description

The existing Los Vaqueros Reservoir was completed in 1997 to provide 100 TAF of offstream water storage to improve water quality and provide emergency supply for customers of the CCWD. Water is diverted from the Delta at the existing Old River facility when Delta water quality is high and impact to Delta fisheries is low and pumped to the Los Vaqueros Reservoir for storage.

An expanded Los Vaqueros Reservoir could provide up to 500 TAF of offstream storage to CCWD and other Bay Area water agencies. New Delta intakes, pumps, and pipelines would be required to fill the new reservoir capacity, and water deliveries would be made from the expanded reservoir to Bay Area beneficiaries through new conveyance facilities.

There are three primary objectives for an expansion of the Los Vaqueros Reservoir:

- Improve Bay Area water quality;
- Improve Bay Area water supply reliability; and,
- Protect and restore the Bay-Delta fish populations.

The first two, Bay Area water quality and reliability improvement are explicit CALFED Program objectives for expansion of Los Vaqueros Reservoir. The third objective reflects the CALFED 's mission to restore the Bay-Delta watershed and the specific goals of the ERP.

Need for Study

The CALFED Program Programmatic EIS/EIR Preferred Program Alternative identified a need for surface water storage located in the San Francisco Bay Area. The problems and needs to be addressed by this additional offstream storage are described in the following sections:

Water Quality

Bay Area water agencies strive to reliably provide the highest quality of drinking water to consumers in a cost-effective and environmentally sensitive manner. Meeting this challenge requires a multifaceted approach that includes aggressive conservation, improving source water quality, water storage, and investing in improved forms of treatment technology and research. The challenge is exacerbated when Delta source water is degraded or experiences variations in quality.

An expanded Los Vaqueros Reservoir could improve water quality for CCWD and other Bay Area water agencies by a combination of capturing higher quality water and blending.

Water Supply Reliability

Drought Reliability. Bay Area water agencies face significant water delivery reductions in drought years and sometimes even in normal years. This is true not only for the agencies that receive Delta water supply from the SBA, but also for the East Bay Municipal Utility District (EBMUD), San Francisco Public Utility Commission (SFPUC),

and CCWD. The SFPUC, Santa Clara Valley Water District, and EBMUD instituted rationing or mandatory cutbacks ranging between 10 and 40 percent, during three of the six drought years (1987-1992).

Aggressive conservation programs, recycled water, storage in reservoirs and groundwater basins, and water transfers, have helped these agencies manage water supplies and minimize the severity of rationing for their customers during dry years. In spite of these efforts, Bay Area water users will continue to face shortages in future dry and critically dry years.

An expanded Los Vaqueros Reservoir could hold water captured in wet years for use by CCWD and other Bay Area water users in extended drought years.

Emergency Supply. East and South Bay water agencies are vulnerable to a water supply disruption in the event of a major catastrophe, such as a levee failure or chemical spill in the Delta or an earthquake. While the San Francisco Bay Area water agencies have dealt with this concern in various ways, as the need for water increases in future years, the need for emergency storage in the Bay Area will most likely increase.

A portion of the expanded Los Vaqueros Reservoir would be allocated to provide several months of emergency supply for both CCWD and partnering Bay Area water users.

Delta Fish Protection and Restoration
Several Delta fishery resources are listed as threatened or endangered under the State and/or Federal endangered species acts, including winter-run and spring-run Chinook salmon, steelhead, and delta smelt.

Further, the ROD established the EWA as one of several actions to address fishery protection as an integral part of the CALFED Program to restore the Bay-Delta. The EWA provides water supply assets that are managed by project and management agencies to repay State and Federal project pumping curtailments that benefit Delta fisheries.

One possible scenario for an enlarged Los Vaqueros Reservoir operation is to supply water to Bay Area water users through a pipeline to the SBA. In addition, this freed up capacity at Banks Pumping Plant could enable more water to be credited to the EWA to compensate for State and Federal project pumping curtailments that benefit Delta fisheries.

Accomplishments

- June 2002 - Nine regulatory and Bay Area water agencies signed an MOU for collaborative studies of the LVE.
- December 2003, Contra Costa County became a signatory to the MOU and DWR and CCWD extended the MOU until December 2004.

- August 2002 - A *Draft Project Concept Report and Executive Summary* was completed identifying potential dam designs and conveyance systems for an expansion.
- May 2003 - A *Draft Planning Report* and 22 supporting technical memoranda were completed that concluded CCWD principles of participation and CALFED Program objectives could be achieved by an expansion project.
- Jan 2003 to July 2003 – Over twenty public workshops and six CCWD Board Meetings were held to brief stakeholders and receive public comments on the *Draft Planning Report*.
- June and July 2003 - The CCWD Board of Directors passed three resolutions authorizing an advisory vote in March 2004 to ask CCWD customers if the expansion studies should continue.
- August 2003 thru March 2004 - A series of monthly Bay Area water and regulatory agency coordination workshops are being held to jointly develop work plans for environmental and engineering review of potential concepts for a future alternatives analysis.
- September 2003 - Issued the *Notice of Initiation of Federal Feasibility Studies.*
- March 2004 - CCWD ratepayers voted to continue studies for the LVE.

Analyses Completed

In May 2003, a Draft Planning Report was completed that summarizes all environmental and engineering studies performed to date. The report focused on providing the CCWD Board of Directors with sufficient information to determine that an expansion could meet CCWD and Bay-Delta Authority Program objectives. The CCWD Board of Directors subsequently authorized a March 2004 advisory vote. The report contains:

- Preliminary environmental reviews of direct impacts from inundation, potential mitigation requirements, strategies, and costs.
- Aquatic surveys and analysis of Delta fish at potential intake structures.
- Preliminary engineering analysis of dam, conveyances, intake structures, and SBA pipeline facilities.
- Preliminary cost estimates for both 300 TAF and 500 TAF reservoir capacities and associated facilities.
- CALSIM II operational modeling of a range of single and multi-purpose reservoir operating scenarios that bracket the potential benefits in supply reliability to Bay Area water agencies and quantify the EWA assets and Delta fishery benefits.
- Water quality modeling scenarios of potential water quality improvements to CCWD and SBA water agencies.

Major Findings

- It is technically and environmentally possible to expand the Los Vaqueros Reservoir by up to 400 TAF.
- The operational scenarios show that expansion of the Los Vaqueros Reservoir could meet both the CALFED Program objectives for expansion of Los Vaqueros Reservoir and CCWD participation principles while meeting some of the drought supply needs of agencies served by the SBA**.**

- A multi-purpose reservoir would provide broad and maximum benefits if operated to provide water quality and reliability benefits in normal and dry years, and EWA benefits in normal and wet years.
- Water quality scenarios indicate that drinking water quality delivered to the SBA water users could be improved by lowering TOC by about one third of its current levels (peak events could be reduced by about one half), and by lowering chloride and bromide by about half their current levels during droughts.
- The mineral content of supplied water, as measured by total dissolved solids could be lowered by about half of its current level during droughts.
- Lowering concentrations of disinfection byproducts causing compounds, such as TOC and bromide has an added benefit of reduced cancer risk to the public.
- Through a combination of improved water quality and blending an additional 145 TAF to 362 TAF of high quality, stored water could be delivered to Bay Area users during a six-year drought (total over 6 years).
- An expanded reservoir using proven state-of-the-art fish screens, could provide two major benefits for Delta fisheries:
    - Reduce impacts to fisheries from existing diversions to the SBA, and
    - Create flexibility for the delivery of water for environmental purposes
- By relieving the large State water pumps of its obligation to supply the SBA, yearly environmental water assets could be created in San Luis Reservoir ranging from 100 TAF to 165 TAF in dry to wet years, respectively.
- The reservoir inundation could impact from 1,100 to 1,960 acres of watershed lands, primarily grasslands (approximately 991 to 1703 acres). Other facilities (e.g., pipelines, pump stations) both in and outside the Los Vaqueros watershed could affect approximately 346 to 447 acres. Most of this land is grassland. Primarily a temporary effect that could be restored after pipeline installation (240 acres).
- Based on CALFED Program guidance, required mitigation lands could potentially range from 2,000 to 9,000 acres.
- Preliminary total planning, design and construction cost estimates for several possible reservoir expansion project configurations, including mitigation, range from $1 to $1.5 billion projected in 2008 dollars.

Next Steps

Future studies will focus on development and analysis of a range of alternatives that can meet study objectives. The following schedule is highly dependent on availability of State and Federal funding.

- Spring 2004 -Issue a *NOP/NOI* for environmental documentation
- Fall 2004 - Conduct scoping meetings and release a *Scoping Report*
- Spring 2005 - Release *Plan Formulation Report*
- Winter 2006 - Release *Draft Feasibility Study Report* and *Draft EIS/EIR*
- Winter 2007 - Release *Final Feasibility Study Report* and *Final EIS/EIR*

UPPER SAN JOAQUIN RIVER BASIN STORAGE INVESTIGATION

Study Description

The ROD recommended evaluating increasing water storage in the upper San Joaquin River basin at Millerton Lake by raising Friant Dam or developing a functionally equivalent storage program. The new water supply developed with additional storage could contribute to restoration of and improved water quality for the San Joaquin River and to facilitate additional conjunctive management and exchanges that improve the quality of water deliveries to urban areas. Other benefits could include hydropower production and flood control. In 2003, Reclamation received authority to undertake a feasibility study of Upper San Joaquin River Storage projects.

Friant Dam is currently operated to supply water to agricultural and urban areas in the eastern San Joaquin Valley and to provide flood protection to downstream areas. Millerton Lake, the largest reservoir in the upper San Joaquin River basin, has a storage capacity of 520.5 TAF. Because the minimum storage for canal diversion is about 130 TAF, the maximum active conservation storage is about 390.5 TAF.

Need for Study

The need for the USJRBSI, described in the following sections, was identified in the ROD and from recent stakeholder input.

San Joaquin River Ecosystem

The reach of the San Joaquin River from Friant Dam to the Merced River confluence does not support a continuous natural riparian and aquatic ecosystem. After completion of Friant Dam, most of the water supply in the river was diverted for agricultural and urban uses, with the exceptions of releases to satisfy riparian water rights upstream of Gravelly Ford and flood releases. Consequently, the reach from Gravelly Ford to Mendota Pool is often dry.

San Joaquin River Water Quality

Water quality in portions of the San Joaquin River has been a problem for several decades due to low flow, and discharges from agricultural areas, wildlife refuges, and municipal and industrial treatment plants. Requirements for water quality in the San Joaquin River have become more stringent and the number of locations along the river at which specific water quality objectives are identified has increased. One location of water quality concern is near Vernalis, where the San Joaquin River enters the Bay-Delta.

Water Supply Reliability

Water supply reliability problems in the study area are evident as severe groundwater overdraft. Additional storage in the upper San Joaquin River basin could increase the reliability of deliveries to CVP contractors or other water users who could receive water through CVP facilities resulting in a reduction in groundwater overdraft. This improved supply reliability would provide opportunities for exchanges with urban water users that improve the quality of urban water deliveries.

Flood Control
Major storms during the past two decades have demonstrated that Friant Dam may not provide the level of flood protection intended at the time the flood management system was designed. Increased water storage capacity in the upper San Joaquin River basin would capture additional flood volume and reduce the frequency and magnitude of damaging flood releases from Friant Dam.

Hydropower
Although the economic feasibility of hydropower-only projects may be limited, developing new storage for water supply, water quality, ecosystem restoration, and flood damage reduction creates opportunities to add hydropower features.

Delta Inflows
Additional storage in the upper San Joaquin River basin could result in increased magnitude, duration, or frequency of inflows to the Delta from river releases intended to improve the San Joaquin River ecosystem or water quality.

Storage Options Under Consideration
Storage options to be evaluated in greater detail as the feasibility study continues include the following:

Raise Friant Dam
Friant Dam is a 319 foot-high concrete gravity dam on the San Joaquin River about 20 miles northeast of Fresno. A dam raise of up to 140 feet would enlarge Millerton Lake by up to 870 TAF.

Construct Fine Gold Creek Reservoir
Fine Gold Creek Reservoir would be located on a small tributary of the San Joaquin River that enters Millerton Lake. Water would be pumped from Millerton Lake into Fine Gold Reservoir and released as needed. Reservoir sizes of up to 800 TAF are being considered.

Construct Temperance Flat Reservoir
Temperance Flat is a wide, bowl-shaped area in the upper portion of Millerton Lake approximately 13 miles upstream of Friant Dam. Temperance Flat Reservoir would capture the flow of the San Joaquin River downstream of Kerckhoff Dam. Three potential dam sites are under consideration: at river mile (RM) 274, RM 279, and RM 286. Multiple sizes and dam types are under consideration at each site.

Construct Yokohl Valley Reservoir
Yokohl Valley Reservoir would be located approximately 15 miles east of Visalia. This reservoir would operate as a pump-back storage reservoir served by the Friant-Kern Canal. It would require construction of a 260 foot-high earth fill dam and two small saddle dams.

Conjunctive Management Options
In addition to a range of surface storage options, the USJRBSI is evaluating opportunities for conjunctive management projects that have the potential to support

USJRBSI objectives. This evaluation will be consistent with CALFED's policy of supporting voluntary, locally controlled groundwater projects.

Accomplishments

- Through a series of interactive stakeholder workshops, Reclamation and DWR determined the potential for a feasible project. As the investigation moves forward, the technical team will use the stakeholder-centered process for input and feedback.
- Stakeholders were interviewed to determine their interest in participating in regional conjunctive management and to more thoroughly define potential opportunities they have already identified. Many stakeholders demonstrated a high level of interest in regional, cooperative opportunities for groundwater storage and banking.
- *Phase 1 Investigation Report*, completed in October 2003.
- Published a *NOP/NOI* in February 2004.

Analyses Completed

- Narrowed the potential viable alternatives to a new reservoir at Temperance Flat, off-stream reservoirs on Fine Gold Creek and Yokohl Creek and enlarging the existing Friant Dam.
- CALSIM was revised to reflect the decision-making process used to allocate water supplies at Friant Dam based on hydrologic conditions, and to estimate the availability of water for release to the San Joaquin River or diversion to the Friant-Kern and Madera canals.
- CALSIM simulations identified the quantity of water that would be available for each Investigation purpose (river restoration, river water quality, and water supply reliability) if the additional water supply created by new storage were operated solely to contribute to that purpose.
- Preliminary analysis of potential environmental impacts, water supply benefits, and construction cost estimates were completed for 17 different surface storage options.

Major Findings

- San Joaquin River water could be stored in a variety of surface water reservoirs. Six surface storage options appear technically feasible.
- Average annual new water supply from storage options could be up to 235 TAF/yr and it could contribute to restoring the San Joaquin River, improving water quality in the San Joaquin River, and increasing water supply reliability.
- Regional interest in additional conjunctive management of surface water and groundwater resources is high.

Next Steps

The next steps in the USJRBSI planning process will be to continue the alternative development and screening, perform detailed evaluation of the alternatives, and select a preferred alternative. As with all the CALFED surface storage programs, the following schedule is highly dependent on State and Federal funding.

- Spring 2004 – Conduct scoping meetings and release a *Scoping Report*

- Summer 2004 – Release *Initial Alternatives Report*
- Summer 2005 – Release *Plan Formulation Report*
- Winter 2006 – Release *Draft Feasibility Study Report* and *Draft EIS/EIR*
- Winter 2007 – Release *Final Feasibility Study Report* and *Final EIS/EIR*

LIST OF ABBREVIATIONS

Bay-Delta	Sacramento River-San Joaquin River Bay-Delta
Bay-Delta Authority	California Bay-Delta Authority
BCPAC	Bay Delta Public Advisory Committee
CALFED	A collaborative effort of over 20 State and Federal agencies to develop and implement a long-term comprehensive plan to restore the ecological health and improve water management for beneficial uses of the Bay-Delta system
CALFED Program	CALFED Bay-Delta Program
CCWD	Contra Costa Water District
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento River-San Joaquin River Delta
DWR	State of California, Department of Water Resources
EBMUD	East Bay Municipal Utility District
ERP	Environmental Restoration Program
EWA	Environmental Water Account
IDSP	In-Delta Storage Project
LVE	Los Vaqueros Expansion
MOU	Memorandum of Understanding
MW	Megawatts
NED	National economic development
NODOS	North-of-the-Delta Off Stream Storage
NOP/NOI	Notice of Preparation/Notice of Intent
OCAP	Operations Criteria and Plan
P&Gs	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
Reclamation	US Department of Interior, Bureau of Reclamation
RM	River Mile
ROD	Record of Decision
SBA	South Bay Aqueduct
SFPUC	San Francisco Public Utilities Commission
SLWRI	Shasta Lake Water Resources Investigation
SWP	State Water Project
TAF	Thousand acre-feet
TAF/yr	Thousand acre-feet per year
TAG	Technical Advisory Group
TOC	Total organic carbon
USJRBSI	Upper San Joaquin River Basin Storage Investigation
WSS	Water Supply Subcommittee